CLAIMS

1. Method of preparation of a monolithic hydrated alumina, the said method comprising, in succession, the following steps:

a) abrading of a surface of a part made of aluminium or an aluminium alloy;

b) covering of the said surface with a mercury amalgam comprising at least one noble metal; and

c) exposure of the said covered surface obtained at b) to a wet oxidizing atmosphere.

2. Method of preparation according to Claim 1, which furthermore includes a step of cooling the said surface, the said step being carried out simultaneously with the exposure step c).

3. Method of preparation according to Claim 2, in which the cooling step is carried out by means of a heat extraction system connected directly to the surface obtained at b).

4. Method of preparation according to any one of Claims 1 to 3, which furthermore includes at least one step of regenerating the surface covered with amalgam, the said regeneration step consisting in removing the amalgam previously deposited and then in redepositing an amalgam, as defined in Claim 1, and in again exposing the newly covered surface to a wet oxidizing atmosphere.

5. Method of preparation according to any one of Claims 1 to 4, characterized in that the aluminium surface is a surface having an aluminium content of 99.99 to 99.999% by weight.

6. Method of preparation according to any one of Claims 1 to 5, in which the noble metal included in the amalgam is chosen from the group consisting of silver, gold, palladium, platinum, rhodium, iridium, ruthenium and mixtures thereof.

7. Method of preparation according to Claim 6, in which the noble metal is silver.

8. Method of preparation according to Claim 7, in which the mercury amalgam has a silver content ranging from 1 to 43 at%, preferably substantially equal to 40 at%, silver.

9. Method of preparation according to any one of Claims 1 to 8, in which the covering step b) is carried out by direct deposition of the amalgam in liquid form on the surface to be covered.

10. Method of preparation according to any one of Claims 1 to 8, in which the covering step is carried out by depositing a mercury salt and at least one noble metal salt directly on the surface, the amalgam forming directly on the said surface.

11. Method of preparation according to any one of Claims 1 to 10, in which the oxidizing atmosphere is air.

12. Method of preparation according to any one of Claims 1 to 11, in which the wet oxidizing atmosphere is such that it has a relative humidity ranging from 20% to 99.99%.

13. Method of preparation according to any one of Claims 1 to 12, in which the exposure step c) is carried out substantially at ambient temperature.

14. Method of preparation of a monolithic amorphous anhydrous alumina, which includes a step of heating the hydrated alumina prepared by a method according to any one of Claims 1 to 13 to an appropriate temperature.

15. Method of preparation of a monolithic alumina crystallized in the δ, γ, θ, κ, κ', or α form, which includes a step of heating the hydrated alumina prepared by a method according to any one of Claims 1 to 13 to an appropriate temperature.

16. Method of preparation according to Claim 15, which includes, when the alumina is of the γ or θ type, before the heating step, a step of exposing the hydrated alumina prepared by a method according to any one of Claims 1 to 13 to the vapour of at least one oxide precursor at a substantially ambient temperature.

17. Method of preparation according to Claim 16, in which the, or at least one, oxide precursor is a silica precursor.

18. Method of preparation according to Claim 17, in which the, or at least one, silica precursor is chosen from the group consisting of tetraethoxysilane and trimethylethoxysilane.

19. Method of preparation according to Claim 15, which further includes, when the alumina is of the δ, γ, θ, κ, κ', or α type, before the heating step, a step of exposing the hydrated alumina prepared by a method

according to any one of Claims 1 to 13 to the vapour of an acid or base at a substantially ambient temperature.

20. Method of preparation according to Claim 19, in which the acid vapour is hydrochloric acid vapour.

21. Method of preparation according to Claim 19, in which the base vapour is ammonia vapour.

22. Method of preparation of a monolithic aluminate, which comprises in succession:

d) a step of impregnating an alumina with at least one compound containing one or more metal elements to be introduced into the said alumina, in order to form the aluminate, the said alumina being produced by a method according to any one of Claims 1 to 21; and

e) a step of decomposing the said compound introduced at d) by heating it, followed by a step of forming the aluminate by heating.

23. Method of preparation according to Claim 22, in which the compound comprising the metal element or elements to be introduced is tetraethoxysilane.

24. Method of preparation according to Claim 22, in which the compound comprising the metal element or elements to be introduced is a metal salt chosen from the group consisting of magnesium, titanium, iron, cobalt, copper, nickel, yttrium, actinide and lanthanide nitrates or chlorides, and mixtures thereof.

25. Method of preparation according to any one of Claims 22 to 24, in which the step of decomposing the compound chosen is carried out in air by heating to a temperature substantially equal to 500°C.

26. Method of preparation according to any one of Claims 22 to 25, in which the step of forming the aluminate is carried out in air by heating to a temperature ranging from 700 to 1400°C.

27. Method of preparation of a composite material comprising an alumina and/or an aluminate and at least one other compound and/or element, the said alumina being obtained by a method according to any one of Claims 1 to 21 and the said aluminate being obtained by a method according to any one of Claims 22 to 26, the said method comprising in succession, the following steps:

f) a step of impregnating the alumina and/or the aluminate with at least one precursor of the said other compound(s) and/or element(s); and

g) a step of forming the said compound(s) and/or element(s), the compound(s) and/or element(s) forming with the alumina and/or the aluminate, after this step, the composite material.

28. Method of preparation according to Claim 27, in which the other compound is chosen from a group consisting of ceramics, metals, polymers and mixtures thereof.

29. Method of preparation according to Claim 27, in which the element is elemental carbon.

30. Method of preparation according to Claim 29, in which the elemental carbon is chosen from the group consisting of graphite, pyrolytic carbon, glassy carbon and mixtures thereof.

31. Method of preparation according to Claim 28, in which, when the other compound is a ceramic, the precursor of this compound is a metal salt chosen from the group consisting of sodium metatungstate, ammonium metatungstate, zirconium oxychloride, calcium, yttrium, actinide, lanthanide, magnesium, copper, iron, cobalt and nickel nitrates, diammonium titanyl oxalate, titanium and barium chlorides, and mixtures thereof.

32. Method of preparation according to Claim 28 or 31, in which the step for forming the ceramic is produced, in air, by heating the said precursors to a temperature of between 400°C and 800°C.

33. Method of preparation according to Claim 28, in which, when the other compound is a metal, the precursor of this compound is a metal salt chosen from the group consisting of iron, cobalt, copper, nickel, lead, tin, zinc, tungsten and molybdenum nitrates, sodium metatungstate, ammonium metatungstate, salts of noble metals (silver, gold, palladium, platinum, rhodium, iridium, ruthenium), and mixtures thereof.

34. Method of preparation according to Claim 33, in which the step for forming the metal comprises a step of decomposing the metal salt or salts, which is carried out in air at a temperature substantially equal to 500°C or at a temperature of 800 to 1200°C, by means of which a metal oxide is obtained after this step, followed by a reduction step, by heating the said metal oxide in order to obtain the metal.

35. Method of preparation according to Claim 34, in which the reduction step is carried out by the action of a reducing agent chosen from the group consisting of

hydrogen and carbon monoxide, at a suitable temperature, preferably ranging from 500 to 1200°C.

36. Method of preparation according to Claim 28, in which, when the other compound is a polymer, the precursor of this compound is a monomer or a monomer mixture.

37. Method of preparation according to Claim 36, in which the monomer is chosen from the group consisting of styrene, aniline, isoprene, ethylene, vinyl chloride, butadiene and mixtures thereof.

38. Method of preparation according to Claim 36 or 37, in which the step for forming the polymer consists of a polymerization step.

39. Method of preparation according to Claim 29 or 30, in which, when the element is elemental carbon, the precursor of this element is a hydrocarbon.

40. Method of preparation according to Claim 39, in which the step for forming the elemental carbon consists of a thermal cracking step.